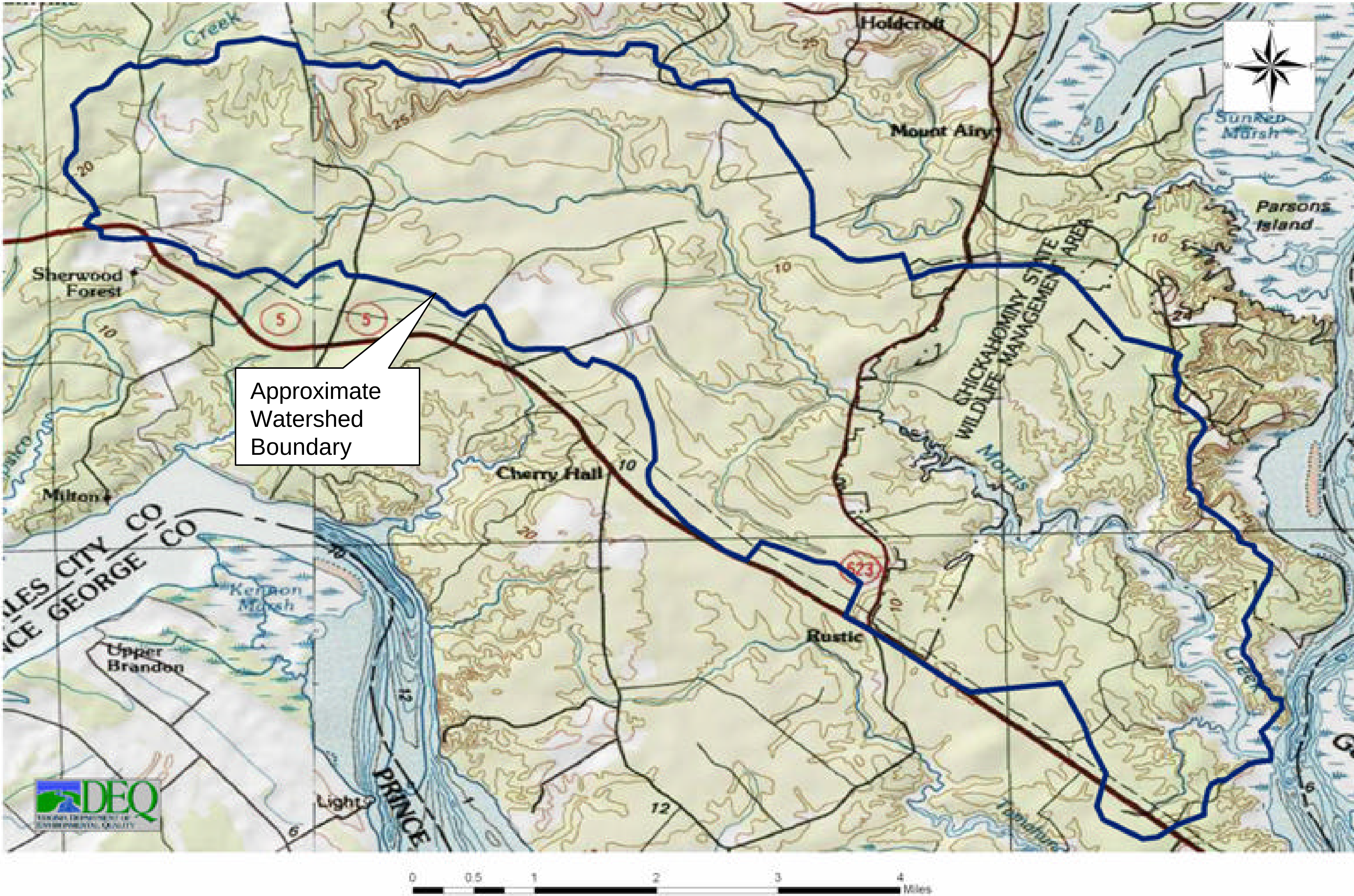
Bacteria TMDL Development for Morris Creek Impaired for Swimming Use

Final Public Meetings

July 15, 2009
Charles City, VA

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY



Approximate
Watershed
Boundary
Holdcroft
Mount Airy
Sunken Marsh
Parsons Island
Sherwood Forest
CHICKAHOMINY STATE
WILDLIFE MANAGEMENT AREA
Morris
Cherry Hall
Milton
CHARLES CITY CO
PRINCE GEORGE CO
Kennon Marsh
Upper Brandon
Rustic
Light
PRINCE
DEQ
0
0.5
1
2
3
4
Miles

What is a TMDL?

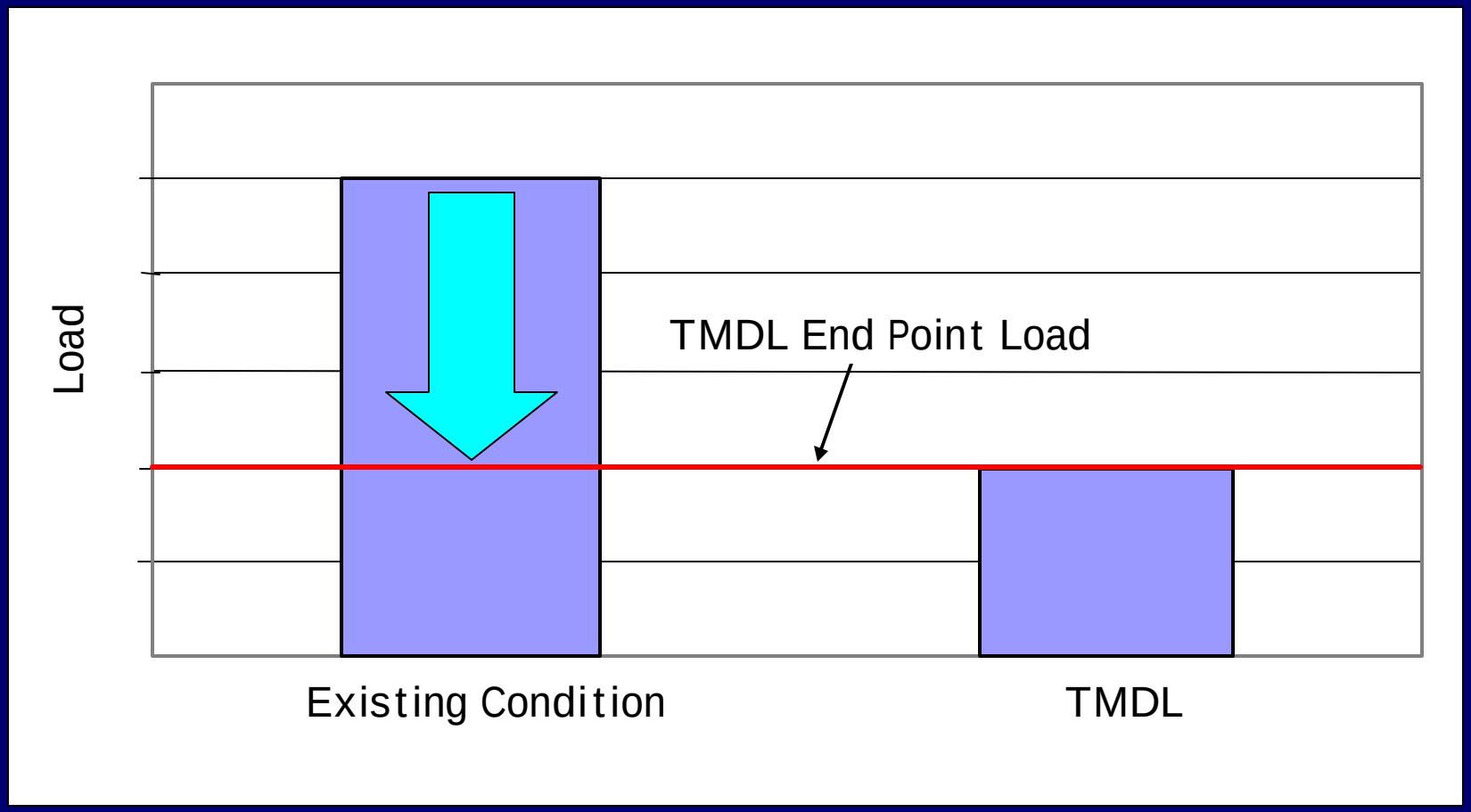
TMDL = Total Maximum Daily Load =

maximum amount of a pollutant that can exist in a waterbody without violating water quality standards (WQS)

WQS = numeric or narrative limits on pollutants that ensure the protection of human health and of aquatic life

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

An Example TMDL



Reducing existing bacteria load to the TMDL end point load is expected to restore water quality.

Why are TMDL studies necessary?

- TMDLs must be developed for water bodies that do not meet water quality standards for their designated use (impaired waters). Federal and State Laws:
  - 1972 Clean Water Act (CWA), Section 303(d)
  - 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA)
  - 1999 Consent Decree due to American Canoeist Association Lawsuit
- Examples of Designated Uses:
  - ***Primary Contact (Swimming)***
  - Aquatic life
  - Fish consumption
  - Public water supply
  - Shellfish consumption
  - Wildlife
- Impaired waters occur throughout Virginia in lakes, streams, and tidal waters.
  - Visit **http://www.deq.virginia.gov/wqa/ir2008.html** for DEQ's 2008 Integrated Assessment Report
- Based on DEQ 2008 Report >1700 Completed TMDLs due by 2022

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

People involved in the Process:

- Virginia Department of Health
- Virginia Department of Conservation and Recreation
- Virginia Department of Environmental Quality
- Other State Agencies, Local Governments and Planning Districts
- U.S. Environmental Protection Agency and other appropriate federal agencies
- Citizens groups, educational institutions environmental groups, & local business
- **YOU**!

What information is used to develop a TMDL?

- Bacteria monitoring data
- Population estimates for humans, pets, wildlife, livestock (Census, DCR, DGIF, & the public)
- Impaired waters volume
- Bacterial Source Tracking Data (BST)
- Land Use, Climate, Tide, etc.
- DEQ permit data
- DEQ spill response and remediation data

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Why is a TMDL needed for the Morris Creek Watershed?

DEQ monitoring stations on Morris Creek were found to be in exceedence of swimming use water quality standard.

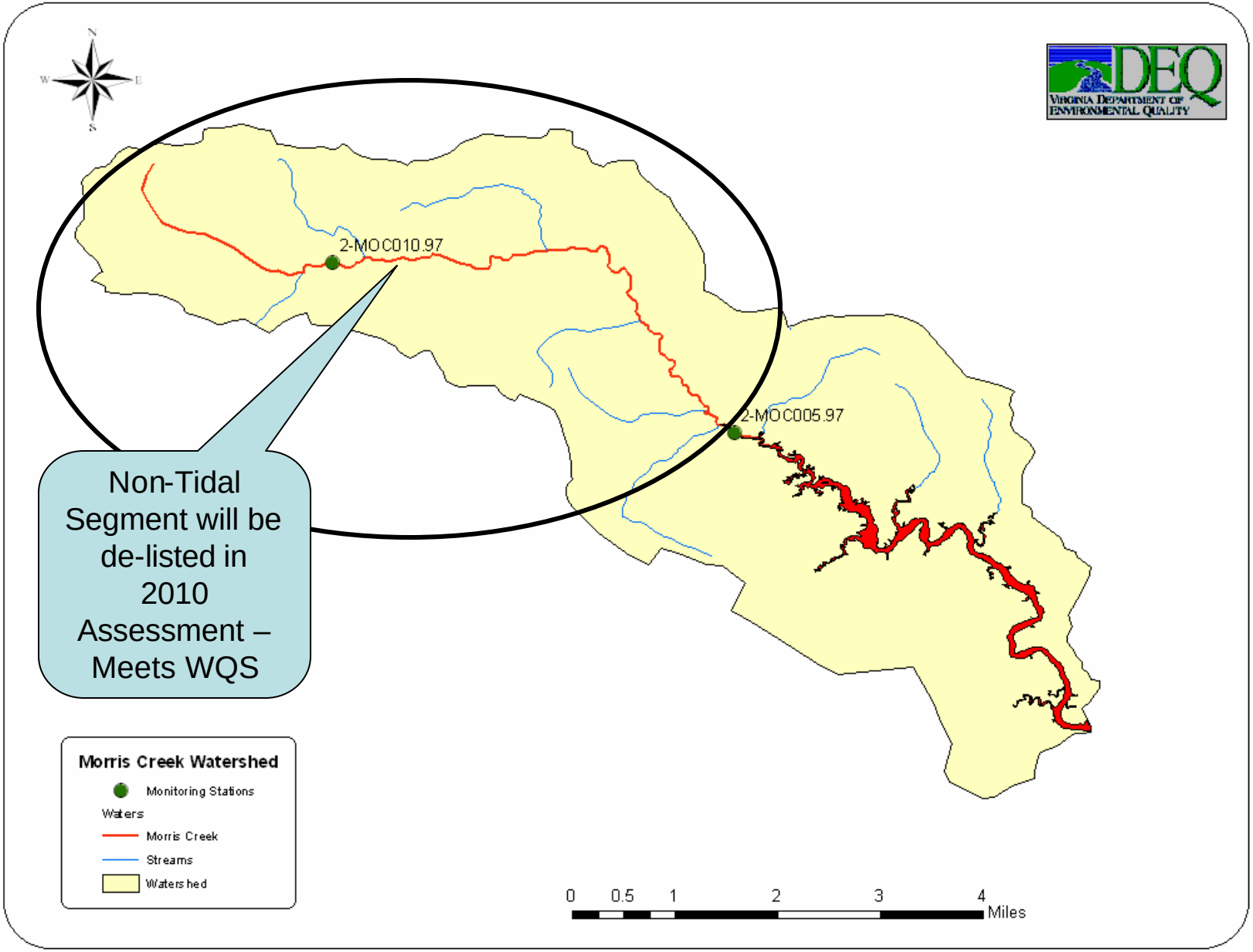
E. coli and Enterococci bacteria per 100 ml of water shall not exceed the following standards:

Indicator Organism	Geometric Mean	Instantaneous Max
E. coli (free-flowing)	126	235
Enterococci (tidal)	35	104

Instantaneous Max may not violate > 10.5% of the time.

Any violation of Geometric Mean = impaired

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY


2-MOC010.97
2-MOC005.97
Non-Tidal Segment will be de-listed in 2010 Assessment – Meets WQS
Morris Creek Watershed
Monitoring Stations
Waters
Morris Creek
Streams
Watershed
0 0.5 1 2 3 4
Miles
DEQ
Virginia Department of Environmental Quality

Water Quality Data Summary for Morris Creek

Station 10.97 Collection Date	*E. coli* #/100ml	Station Exceeds Freshwater Instantaneous Max Standard 235
1/17/2006	7.0000	No
2/21/2006	5.0000	No
3/20/2006	15.0000	No
4/26/2006	120.0000	No
5/15/2006	37.0000	No
6/20/2006	200.0000	No
7/24/2006	45.0000	No
8/22/2006	320.0000	Yes
9/27/2006	20.0000	No
10/23/2006	53.0000	No
11/15/2006	28.0000	No
12/11/2006	13.0000	No

Non-tidal Data

Station 10.97

(Rt. 614 Bridge)

Violation Rate

1 / 12 = 8.3% < 10.5%

Waterway Not Impaired

DEQ
Virginia Department of Environmental Quality

Water Quality Data Summary for Morris Creek

Station 5.97 Collection Date	Enterococci #/100ml	Station Exceeds Saltwater Instantaneous Max Standard 104
12/20/2005	25.0000	No
2/15/2006	25.0000	No
4/19/2006	50.0000	No
6/20/2006	100.0000	No
8/28/2006	50.0000	No
10/23/2006	75.0000	No
12/5/2006	120.0000	Yes
3/1/2007	25.0000	No
5/17/2007	25.0000	No
7/17/2007	500.0000	Yes
9/18/2007	400.0000	Yes
11/28/2007	100.0000	No
1/9/2008	100.0000	No
3/17/2008	100.0000	No
5/15/2008	100.0000	No
7/1/2008	100.0000	No
9/3/2008	100.0000	No
11/5/2008	200.0000	Yes

Tidal Data Station 5.97

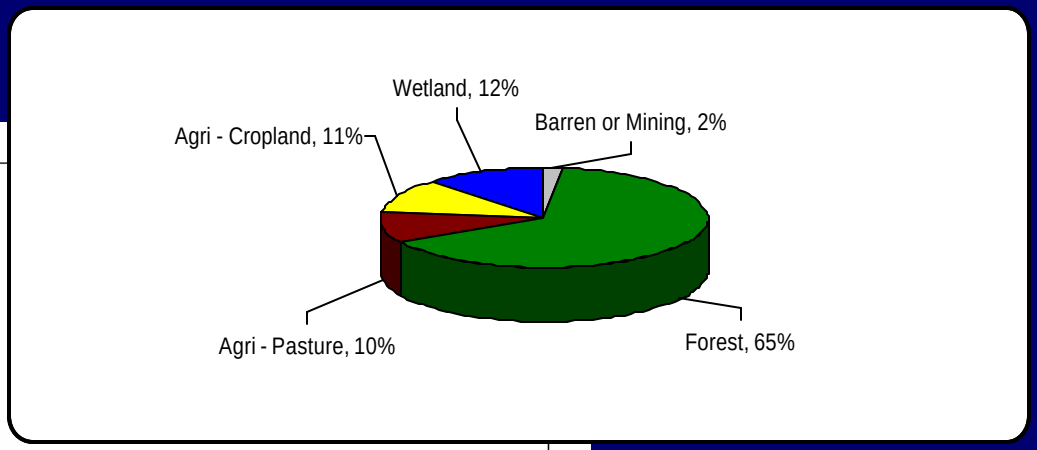
(Rt. 623 Bridge)

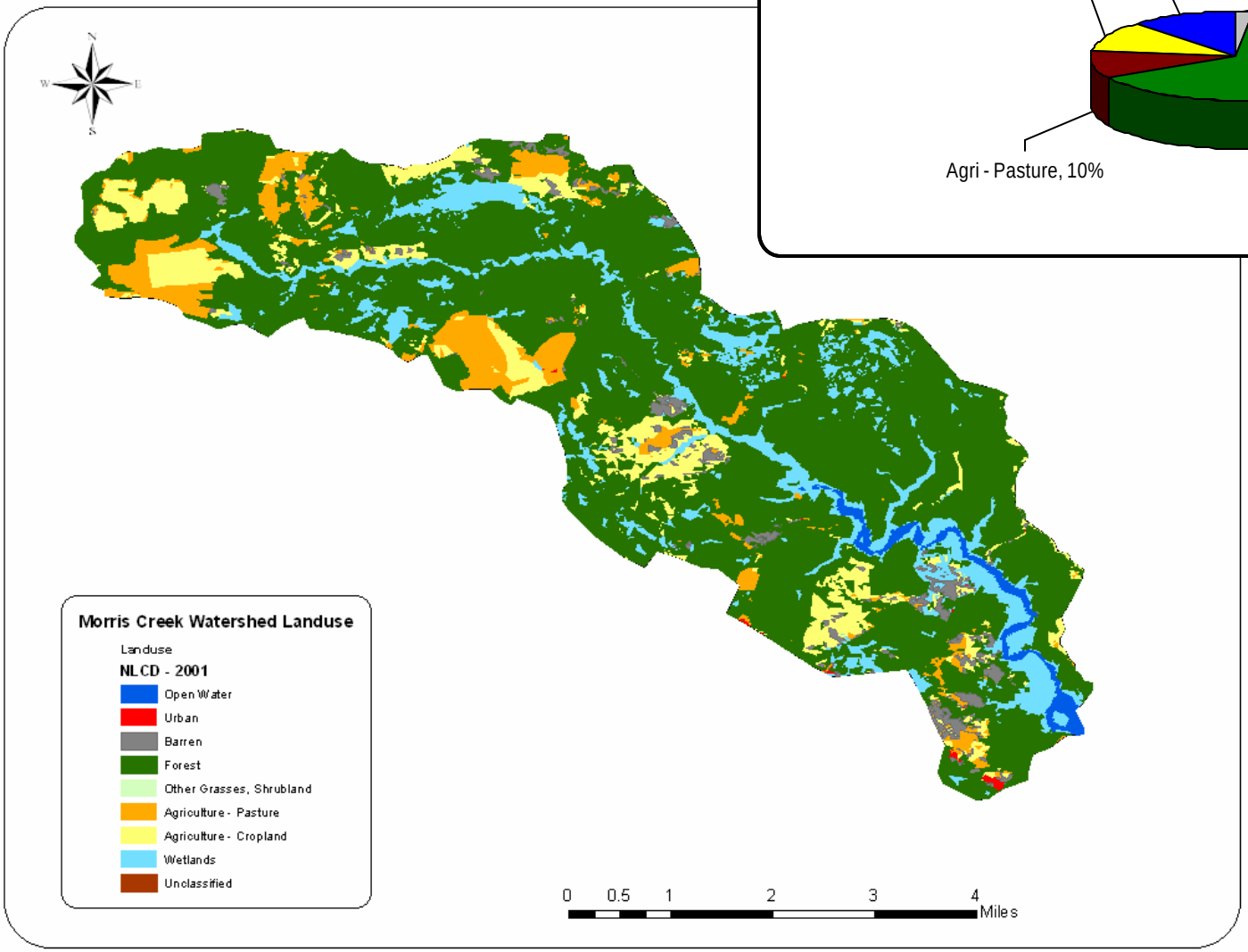
Violation Rate

4/18 = 22.2% > 10.5%

Waterway Impaired

Land Use in Morris Creek





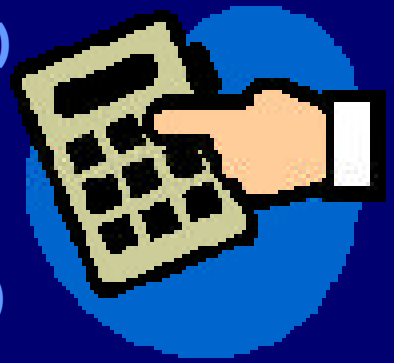
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Tidal Volumetric Model + BST TMDL Approach

- Calculate volume of impaired water
- Calculate the acceptable loading (TMDL);

  Water Quality Standard (WQS tidal SSM) x Volume

  104 X 2810621 m^3 = **2.92E+12 (cfu/day)**



- Calculate actual loading (current load);

  Highest bacteria count (tidal data) x Volume

  500 X 2810621 m^3 = **1.41E+13 (cfu/day)**

- Source determination;

  Water samples collected for BST are subjected to Antibiotic Resistance Analysis (ARA) and compared with known “library” samples

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Use of Bacterial Source Tracking in TMDLs

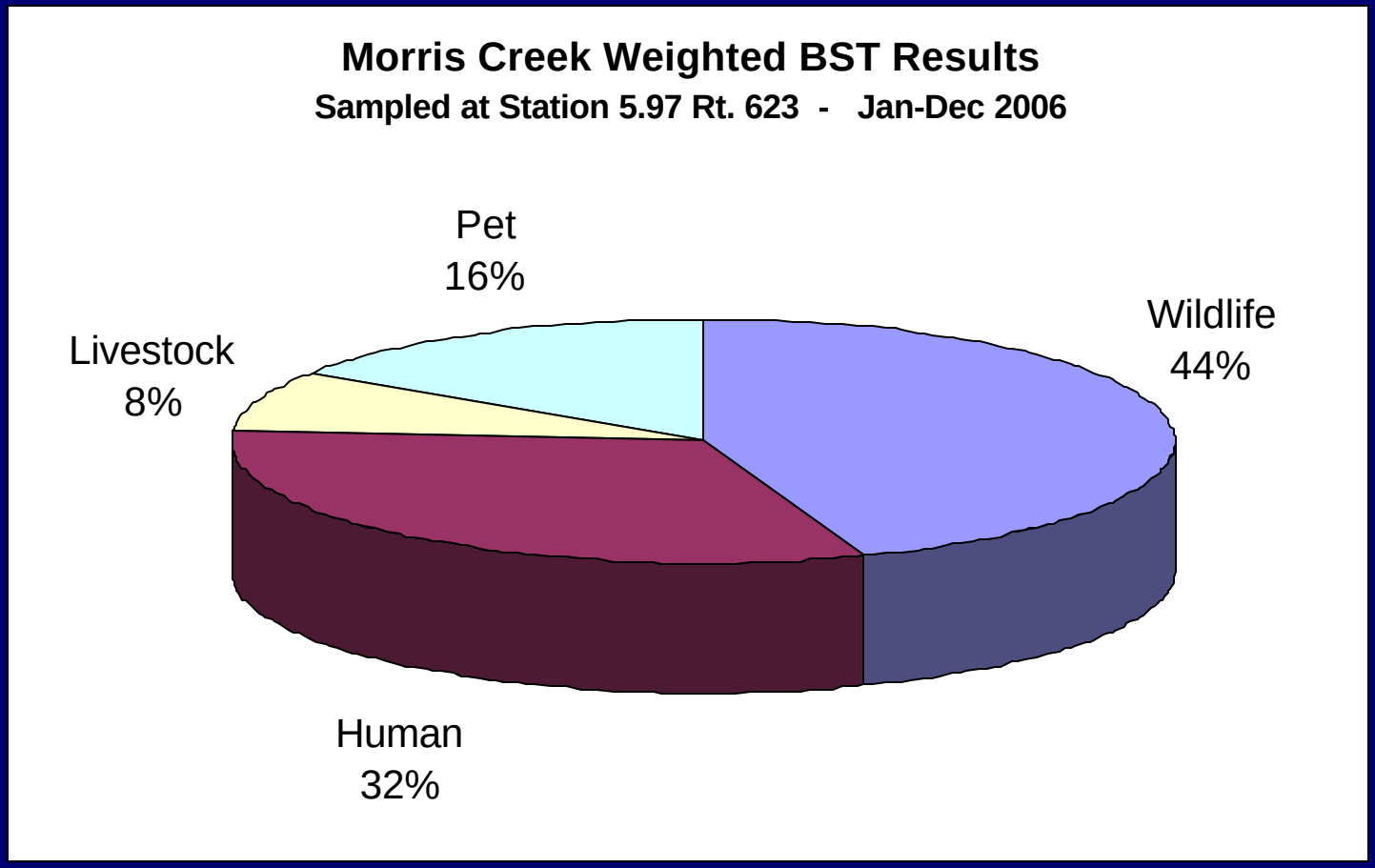
- About 12 additional water samples are taken at impaired station (1/month)
- Samples are subjected to Antibiotic Resistance Analysis
- Samples are then compared to known isolates from a library
- BST method allows for allocation of non-point sources into 4 categories:

Human
Pets
Livestock
Wildlife

H + P + L = Human Controlled Sources

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Morris Creek BST Results



H + P + L = 56 %

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Population and Source Estimates

97 homes x 2.59 people/home = 251 people in watershed

251 people x 12% (default failure rate) = 30.12 people / 2.59 people/home = 11.6 homes

Estimated Failing Septic Systems in the Watershed = 12

****Charles City VDH Staff said only 12 conventional and 1 alternative system in the watershed so this estimate is rejected. No current "failing systems", all other residents are on public sewer****

Domestic Animal and Wildlife #'s for Morris Creek Watershed

	Cattle	Chickens	Muskrats	Dogs	Deer	Raccoons	Ducks	Goats/ Sheep	Geese	Horse
Morris Creek	20	20	9800	425	450	500	50	185	65	1

Wildlife numbers calculated via DGIF density estimates. Dog numbers estimated by Charles City Co Animal Control Staff. Goats/sheep and horse count a result of DEQ staff observations. Livestock calculated from USDA Census (2007)

Calculated Loads and % Reduction

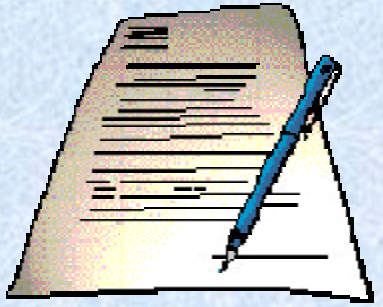
Waterbody	Volume (m^3)	Single Sample Max Enterococci (cfu/100mL)	SSM Water Quality Standard Enterococci (cfu/100mL)	Current Load (cfu/day)	TMDL Allowable Load (cfu/day)	Required Reduction (%)
Morris Creek	2810621	500	104	1.41E +13	2.92E+12	79%

Load Allocation and Wasteload Allocation = TMDL

Waterbody	Pollutant Identified	TMDL cfu/day	Waste Load Allocation cfu/day (Future Growth)	Load Allocation cfu/day	Margin of Safety
Morris Creek	Enterococci bacteria	2.92E+12	2.92E+10	2.89E+12	Implicit

Next Steps…

- **30 Day Public Comment Period**
  - Ends August 13th, 2009
  - Include name, address, and telephone number please!
- **Respond to public comments and finalize draft**
- **Final Draft Report sent to EPA & SWCB for approval**
- **Approved TMDL eligible for Implementation Planning & Implementation with DCR**



VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

How can you help?

PARTICIPATE IN THE DEVELOPMENT OF TMDL AND IMPLEMENTATION PLANNING!

- Verify our data
- Comment on the draft TMDL report during 30 day public comment period
- Attend future meetings on implementation planning
- Minimize runoff from your property
  - rainbarrels, raingardens
  - install pervious surfaces vs. impervious surfaces
- Don’t feed wildlife!!! Educate your neighbors!
- Pick up after pets
- Maintain septic systems

Questions?? Comments??

Presentations and other handouts available at:

http://www.deq.virginia.gov/tmdl/mtgppt.html

Morris Creek TMDL Draft Report available at:

https://www.deq.virginia.gov/TMDLDataSearch/DraftReports.jspx

Please send written comments or questions to:

DEQ - Piedmont Regional Office
Attn: Margaret Smigo
4949-A Cox Road
Glen Allen, VA 23060
Email: mjsmigo@deq.virginia.gov

TMDL Website: http://www.deq.virginia.gov/tmdl

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY